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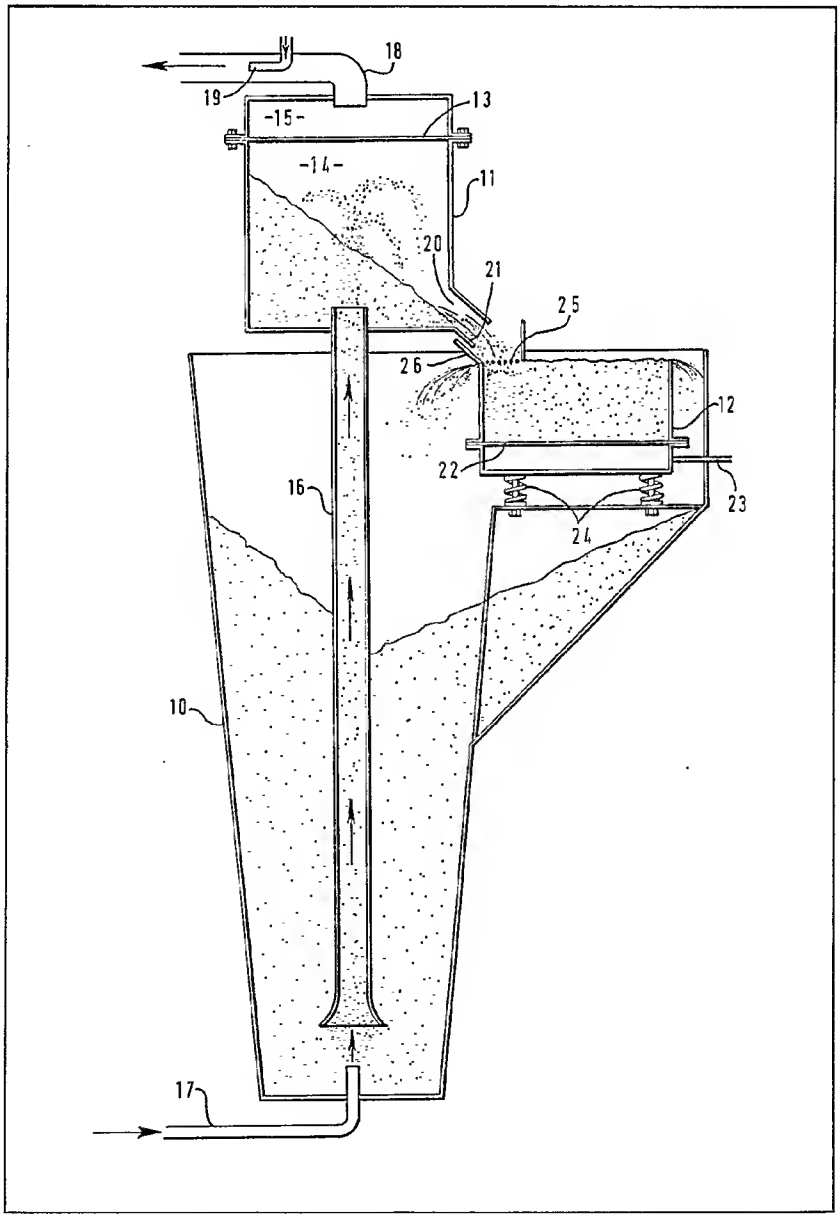
(54) **Conveyor for particulate material**

(57) Particles are conveyed pneumatically from a bulk supply in a container (10) to a chamber (14), where an air pressure substantially equal to the ambient pressure is maintained. The particles leave the chamber (14) under the action of gravity and flow to a fluidised bed used for coating articles with the material of the particles.



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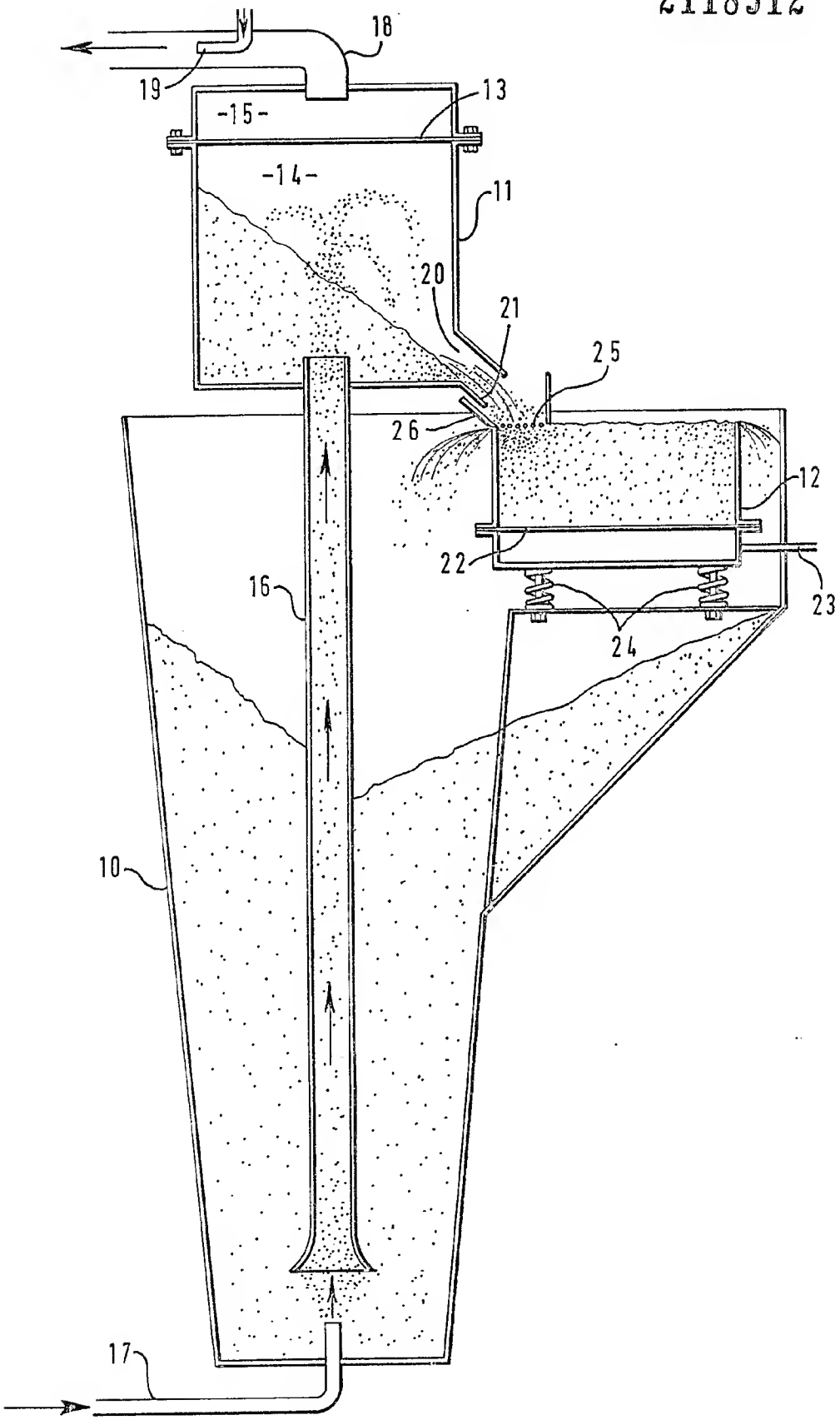
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SPECIFICATION

Conveyor for particulate material

This invention is concerned with a conveyor for conveying particulate material from one location to another, primarily (but not exclusively) to a higher location.

According to one aspect of the invention, there is provided a conveyor for conveying particulate material which comprises a conduit extending from a first location to a second location at which it communicates with a chamber, means for producing an air stream in said conduit to convey material, entrained therein, from said first location to the chamber at said second location, and means for evacuating air from said chamber.

The term "air" as used herein is intended to include any appropriate gas or gaseous mixture.

The provision of means for evacuating air from the chamber facilitates avoidance of a pressure in the chamber which is significantly in excess of the ambient atmospheric pressure. It will be appreciated that the chamber has an outlet for the particulate material and that, if the pressure in the chamber is permitted to rise significantly above the ambient pressure, particulate material would be blown from the chamber through the outlet. If the pressure in the chamber is maintained at or close to the ambient pressure, a steady gravity flow of particulate material can be maintained through a suitably positioned outlet without that flow being affected by flow of air through the outlet.

It is primarily intended that the chamber will be disposed at a location which is higher than said first location and arranged vertically above it or to one side, the conduit being vertical or at an angle to the vertical.

The conveyor may include a container to hold a supply of particulate material, the end of the conduit at said first location being disposed in the container so that, in use, it lies below the level of a surface of a mass of the material in the container. In this event, the means for producing an air stream in the conduit preferably comprises an inlet for air under pressure in the container opposite and at a spacing from said end of the conduit so that, in use, air is blown from the inlet into and along the conduit, picking up material as it passes from the inlet into the conduit and then conveying the material, entrained in the air stream, along the conduit into the chamber.

The chamber may have an outlet which is so disposed in relation to the body of particulate material which settles in the chamber, that there is a gravity flow of material through the outlet. The rate of flow can be varied by regulating the pressure of the air conveying material to the chamber and the rate of evacuation of air from the chamber, whilst at the same time maintaining the correlation between these two factors which is necessary to ensure that material is allowed to settle in the chamber, instead of being carried by the air sream through the outlet.

The means for evacuating the chamber may comprise a filter which is permeable to air and will not permit particulate material to pass through it, the chamber being in communication through this filter with suction means so that, in use, air is drawn from the chamber through the filter.

According to a further aspect of the invention, there is provided a method of conveying particulate material from a first location into a chamber at a second location wherein there is provided a conduit leading from the first location into the chamber, a stream of air is directed into an open end of the conduit at said first location, the particulate material is entrained in the air which enters the conduit at the first location and is carried by the air into the chamber, the stream of air leaves the chamber through a filter and the air pressure within the chamber is maintained at a value at least approximately equal to the ambient atmospheric pressure.

The air pressure at a face of the filter outside the chamber is preferably maintained substantially below the ambient atmospheric pressure.

The invention will now be described in detail, by way of example, with reference to the accompanying drawing which shows in vertical section one form of conveyor embodying the invention.

The conveyor illustrated in the drawing has been designed for use in an apparatus for coating objects with thermoplastics material. The conveyor has a container 10 to hold a supply of powdered thermoplastics material and is adapted to convey material from the container to a box 11 at an elevated location from which the material is discharged into a container 12 providing a fluidised bed. Heated objects are conveyed through the fluidised bed so that material sticks to them and forms a coating thereon.

When the apparatus is in use, the depth of the fluidised bed in the container 12 is maintained constant by supplying particles to the container at a rate such that the fluidised bed always occupies the container 12 completely and particles overflow walls of the container 12 and fall back to the mass of particulate material in the container 10. Articles which are to be partly coated with the thermoplastics material are dipped to a predetermined extent into the fluidised bed.

The box 11 is divided by a partition 13 into a lower chamber 14 and an upper chamber 15. Mounted in the container 10 is a vertical tube 16, the lower, open end of which is spaced from the bottom of the container, and the open, upper end of which communicates with the lower chamber 14 of the box 11.

A pipe 17 connected to a source of compressed air extends through the bottom of the container 10 to provide an inlet for air under pressure which is disposed opposite, and at a spacing from, the lower end of the tube 16.

In use, the container 10 is filled with powdered plastics material to an appropriate level, and the air blown by the pipe 17 into and along the tube 16 picks up material as it passes from the inlet provided by the pipe into the tube and then conveys the material, entrained in the air stream, along the tube into the lower chamber 14 of the box 11.

Connected to the upper chamber 15 of the box is a pipe 18 containing a further, smaller pipe 19. The pipe 19 is arranged to blow air into the pipe 18 in a direction away from the upper chamber 15 so that air

is evacuated from and a partial vacuum is created in the upper chamber. The partition 13 is of a material which is permeable to air but such that the powdered material cannot pass through it. During use of the apparatus, the stream of air which flows along the tube 16 leaves the lower chamber 14 through the partition 13 and a substantial pressure drop is maintained across the partition. The effect of the partial vacuum in the upper chamber is to limit the pressure in the lower chamber 14.

The lower chamber 14 of the box 11 has an outlet 20 at a level below that of the partition 13 and, preferably, at the level of the bottom of the box 11. A chute 21 leads from the outlet 20 to the container 12. When the apparatus is in use, the particulate material which is conveyed into the chamber 14 flows under the action of gravity only through the outlet 20 and down the chute to the container 12. The respective pressures at which air is delivered to the pipes 17 and 19 or the respective rates of flow of air through these pipes are so adjusted that the air pressure in the chamber 14 is maintained at least approximately at the ambient atmospheric pressure outside the lower end of the chute 21. In this way, significant flow of air in either direction through the outlet 20 is avoided. The flow of particles through the outlet 20 is neither promoted by not inhibited by flow of air.

Particles which are conveyed into the chamber 14 are prevented from passing into the chamber 15 by the partition 13 which acts as a filter. The particulate material includes particles having a wide range of sizes and includes fine particles which are important in the coating process. As the air stream emerges from the conduit 16 into the chamber 14, the velocity of the air stream falls to a value such that the majority of the entrained particles fall towards the bottom of the chamber 14. Particles which are sufficiently fine to remain entrained in the slower air stream are separated from the air stream by the filter.

The fluidised bed is of conventional form. The container 12 is divided into upper and lower chambers by a horizontal air permeable partition 22, the upper chamber containing the bed of thermoplastics material and the lower chamber being connected by a pipe 23 to a source of compressed air. The air under pressure entering the lower chamber passes through the partition 23 and fluidises the material in the upper chamber.

The container 12 is supported by resilient mountings 24 and connected to a vibrator (not shown).

The powder discharged from the box 11 through the chute 21 falls onto a mesh 25 which extends the full length of the container 12, and an inclined, perforated plate 26 which extends alongside the mesh. The mesh and the plate are wider than the chute 21.

There is a build-up of powder on the mesh 25 and the plate 26 and the powder spreads across their full width. As powder falls through the mesh 25, powder is therefore introduced into the fluidised bed along the full length thereof. There is a guard plate 27 to prevent powder being discharged directly into the fluidised bed.

If an excess amount of powder accumulates on the plate 26, powder flows through the plate into the cntainer 10 so that it is then re-cycled through the apparatus.

It is important to maintain a regular flow of powder to the fluidised bed, and this is achieved by adjusting the pressure of the air blown into the tube 16 and the pressure of the air blown into the pipe 18 and hence the partial vacuum in the upper chamber of the box 11, the two pressures being suitably balanced so that powder is allowed to settle in the lower chamber of the box and is not blown through the outlet 20. The rate of flow of powder to the fluidised bed can be varied by adjusting the two pressures whilst maintaining the necessary correlation between them.

CLAIMS

1. A conveyor for conveying particulate material which comprises a conduit extending from a first location to a second location at which it communicates with a chamber, means for producing an air stream in said conduit to convey material, entrained therein, from said first location to the chamber at said second location, and means for evacuating air from said chamber.

2. A conveyor according to Claim 1 including a container to hold a supply of particulate material, wherein the end of the conduit at the first location is disposed in the container so that, in use, said end lies below the level of a surface of a mass of the material in the container.

3. A conveyor according to Claim 2 wherein the means for producing an air stream in the conduit comprises an inlet for air under pressure in the container opposite to and spaced from said end of the conduit.

4. A conveyor according to any preceding claim wherein the chamber has a bottom outlet through which particulate material flows from the chamber, during use.

5. A method of conveying particulate material from a first location into a chamber at a second location wherein there is provided a conduit leading from the first location into the chamber, a stream of air is directed into an open end of the conduit at said first location, the particulate material is entrained in the air stream which enters the conduit at the first location and is carried by the air stream into the chamber, the stream of air leaves the chamber through a filter and the air pressure within the chamber is maintained at a value at least approximately equal to the ambient atmospheric pressure.

6. A method according to Claim 5 wherein the air pressure at a face of the filter outside the chamber is maintained substantially below the ambient atmospheric pressure.

7. A method according to Claim 5 or Claim 6 wherein the particulate material flows from the chamber under the action of gravity.

8. Apparatus substantially as herein described with reference to and as shown in the accompanying drawing.

9. A method of conveying material substantially

as herein described with reference to the accompanying drawing.

10. Any novel feature or novel combination of features disclosed herein and/or shown in the accompanying drawing.

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